SECTION 9. ELECTRICAL STANDARDS

9.1 HIGH VOLTAGE WORK REQUIREMENTS

Before any power outages or distribution work will be authorized there must be a face to face meeting between the contractor in charge of the outage and the Exterior Electric Shop in order to coordinate the details and material to be used.

All contractors working with the base's high voltage systems must comply with OSHA standard 1910.269(a)(1)(iii), 1910.269(I)(1), and must submit written proof that employees have been trained to work around high voltage lines or equipment. Contractors are required to submit current certifications for every individual involved with preparing High Voltages splices and elbows.

Any work on or near energized distribution lines or equipment requires a lockout/tagout and hot line hold before any work begins.

All distribution lines and equipment to be worked, which are de-energized for any reason, must be properly grounded out using proper grounding sets on both sides of the work area.

All distribution tools and equipment used for working on the distribution system such as; Bucket Trucks, Hot Sticks, Rubber Goods require dielectric testing. Written certification of all tests must be made available to the Government upon request.

9.2 TRANSMISSION AND DISTRIBUTION

Existing transmission and distribution information is described in Section 3.0 - Regional.

New distribution is comprised of overhead and underground installations. As a general rule the overhead distribution system will be extended using class 2 wood poles to accommodate new facilities. However, all distribution system installations in housing areas will be installed via underground duct banks without exception. Additionally when the proposed distribution system passes within 15 meters (50 feet) from the front of a new facility the installation will be underground.

9.3 GENERAL

All High voltage underground cable shall be Copper EPR with a 100% jacketed concentric neutral. No drain wire or shielding.

The use of full size underground manholes is not allowed. Use sector boxes where possible. Large two cover pull boxes are ok with no elbows.

All fused cutouts on primary DIP poles, or in-line will be load break type, rated for 200 amps. Fuse size will be determined by the actual requirement. The Exterior Electric Shop will determine fuse size for all transformers and in-line cutouts.

All underground primary cables will be marked with phase letter corresponding to the phase from which it originates, and markings to show where the cable feeds to and from.

All primary cables entering or leaving a sector box will be trained to allow easy removal and installation of the elbows.

All sector boxes will have ground sleeves or basements. Sector boxes should be sized to provide at least one spare take off point for future use. Ground connections that are made in transformers, sector boxes, and on poles will be high compression crimp type, no mechanical connections are allowed.

No existing primary underground cable will be reused in conjunction with a new installation. If distribution work requires anything more than a disconnect/reconnect situation, the entire cable shall be replaced with new. Any modifications to an existing cable run requires complete replacement of the cable.

9.4 SERVICE ENTRANCE

All primary voltage underground feeders, including installations under new roadways shall be in concrete-encased rigid conduit. Primary underground feeders under existing roadways will be bored or jacked. Use "stirrup" connectors to connect service feeders to overhead conductors.

9.5 GROUNDING IAW ETL 90-6, AND AFI 32-1065

Provide separate grounding conductors and rods for surge (lightning) arrestors and service neutrals. Provide insulated grounding conductors to all grounding type outlets. Metallic conduit shall not constitute a safety ground. Include in specifications: Use three-point ground test and instrumentation in accordance with IEEE Std 81-1983 paragraph 8.2.1.2. Perform test in presence of the government inspector. Submit results and indicate type of test performed.

Provide Cathodic Protection IAW ETL 91-6, and AFI 32-1045

When Lightning Protection has been identified as a requirement it shall be provided IAW ETL 90-6, AFI 32-1065, and NFPA 780. For buildings located within the Munitions

area, a drawing of the system with test results must be submitted for approval prior to building acceptance.

All outdoor equipment shall be painted green in accordance with the standard colors identified in the BDS Architectural/Structural section.

9.6 TRANSFORMERS

Provide service transformers with delta primary and wye secondary connections for three phase services. Base primary service is 12470/7200 V. All service transformers shall have two 2-1.2% taps above and below rated voltage. Provide low percent Z transformers where short circuit currents permit. Screen all exterior transformers from major circulation routes or common areas. Load break switch, primary bayonet fusing, loop fed, load break bushings, 4 point counter poise grounding, lightning protection.

Pad-mount transformer enclosures shall be provided and the façade shall match with the adjacent facility. Provide at least a 1.4-meter (4-ft) clearance around all distribution equipment located within an enclosure. Pad mount distribution equipment not located in an enclosure shall have a minimum clearance of 3 meters (10 feet).

9.7 PANEL BOARDS

Provide typed panel schedules. Provide manual bypass for all auto transfer generator panels. 25% spare capacity, provide load calculations in the design analysis.

9.8 INTERIOR LIGHTING

Provide wire guards for all open fluorescent lamps. Utilize energy saver 32-34 watt fluorescent lamps with energy saver ballast in administrative and similar areas. Use high-pressure sodium lights in bay areas where color rendition is not vital. Provide seismic zone 2 protection for all fixtures, especially ceiling grid mounted fluorescent fixtures. Provide Certified Ballast Manufacturer (CBM) listed ballast. All ballasts shall have 0.90 power factor or greater. LED Exit lights, Emergency Lighting IAW ETL 94-5. Use Compact Fluorescent lights as opposed to incandescent lights.

9.9 EXTERIOR LIGHTING

For parking lot lighting, and roadway applications use 250W HPS with photocell activation. Parking lot light poles shall be round and tapered, and have an anodized bronze finish.

The lamp wattage for street lighting varies between 250W and 400W, check with exterior electric shop for each application. All existing housing and new housing area street lighting shall be 100W metal halide, use 3-meter (9-foot 9-inch) Tapered fluted light poles, black color and 43-cm (17-in) diameter base (match existing poles in the Dunes housing area). For roadway lighting use anodized bronze finished, horizontal fixtures (Cobra Head Style), 10.5-meter (35-ft) high steel poles with 3.6-meter (12-ft) long single arm support. The poles shall be set back 1.5 meters (5 ft) from the curb. Each pole shall have a 15-cm (6-in) high concrete base for roads, and parking lot poles shall have a 60-cm (24-in) high concrete base.

Use 1000W or 400W Metal Halide for outdoor sports field lighting, with timers/photo cell activation.

Use 250W HPS with quartz backup, or fluorescent for security lighting.

Airfield Lighting IAW AFMAN 32-1076

9.10 WIRING DEVICES

Provide new devices and plates whenever an area is renovated. All devices shall be recessed except in mechanical rooms and utility areas. Provide devices rated at 20 amps where heavy use or electrical load dictates the need for 20 amp devices. All wiring shall be copper. No aluminum allowed.

9.11 AUTOMATIC CONTROLLERS

Provide battery backup for lawn sprinkler system controllers and automatic setback thermostats.

9.12 GENERATORS

Automatic Transfer Switches: Provide a bypass switch to allow all power to be disconnected from the transfer switch while maintaining power to the facility. This will allow maintenance of the switch without causing an outage.

Emergency Generator Rooms: Provide generator rooms with automatic louvers and exhaust fans for ventilation. Provide overhead and side lighting to minimize shadows. Provide water outlet, bay or double doors to allow replacement of generator, minimum 800 mm (30 inches) working clearance all sides. Provide sound dampers. Auto-transfer switches and start panels shall be located in the generator room.

A monitoring system shall be installed on RPIE generators. The existing system is an Onan network control and monitoring system. The Monitoring and Control system shall

include at least the following remote capabilities: generator status, fuel level, coolant temp, oil pressure, transfer status, phase availability to load, generator voltage level, battery voltage level, and start/stop capability.

Each RPI generator should have a phone line installed next to the transfer switch. Per AFI 32-1063/ACC Supplemental I at least 72 hours of fuel storage in a double walled tank must be provided as part of each installation. All permanently installed generators must include a quick disconnect switch to allow for the rapid installation of a mobile unit during extended down time for the RPIE unit.

9.13 Over-current Protective Devices

The minimum sized device for branch circuit over-current protection is 20 amps. Ensure proper coordination and withstand ratings for all over-current protection devices. Demonstrate coordination with first upstream existing protective device. Replace old circuit breakers with new when remodeling facilities. If replacement breakers are unavailable, consider replacement of entire panel board. Main fusing is acceptable for limiting short circuit currents; however, place a box with one full set of spare fuses adjacent to main panel.

9.14 Electrical Identification

Provide plastic panel board and disconnect labels. Labels shall be laminated (black with white core) engraved with 6.4-mm (1/4-in) high letters. Attach to front exterior of enclosures. Labels shall match plan designations. Provide non-ferrous phase and circuit identification labels in all enclosures for feeder circuit conductors. Provide underground marker tapes for all underground conductors. If underground conductors are not in metallic conduit, provide marker tape with foiled backing to facilitate detection.

9.15 Power Factor Correction

Add power factor (PF) capacitors to induction motors (10 HP or larger) to correct PF to 0.90 (+0.05, -0.00). Switch PF capacitors in with the motor. Size capacitor IAW IEEE 141, NEMA MG2 and motor manufacturer recommendations.

9.16 Power Service

Power requirements for buildings shall be 480 or 208/120 depending on building function.

9.17 ELECTRICAL RELATED WORK

Balance loads on phases within 10% at all panel boards. Conduit fault calculations to ensure proper withstand ratings for all protective devices. Ensure coordination for all protection devices, conductors, enclosures and equipment.

All electrical equipment shall be supported to meet seismic protection for zone 2. Use automatic setback thermostats in areas not normally occupied 24 hr/day, 7 day clock, battery backup. Emphasize maintainability in all designs

9.18 RACEWAYS

Conduit run in concrete shall be PVC unless steel conduit is needed for a specific reason, i.e. to limit fault currents. Underground primary voltage feeders shall be in concrete encased conduit. All penetrations of fire resistance rated walls shall be fire stopped IAW NEC Article 300-21. Highlight compliance with NEC Articles 300-5(g) and 300-7(1) regarding moisture seals.

9.19 CONDUCTORS

Aluminum conductors smaller than No. 4 AWG may not be used IAW ETL 83-3. In mission critical facilities, housing, dormitories, and transient quarters, aluminum conductors may only be used for service entrances. The smallest branch circuit conductors acceptable are No. 12 AWG. Conductors No. 6 AWG and larger shall have heat resistant insulation.

9.20 COLOR CODING

Color coding for all three phase circuits shall be in accordance with the following:

	480V	208V
Phase A	Yellow	Black
Phase B	Brown	Red
Phase C	Orange	Blue
Neutral	White	White
Ground	Green	Green

9.21 CONDUITS BORED AND JACKED UNDER ROADWAYS

All new utility lines shall be run in 15-cm (6-in) PVC underground conduit and concrete encased under new roadways only, provide 1 spare conduits from transformer to building.

Underground lines shall have PVC to Schedule 80 Steel transition when going from underground to overhead.

9.22 METERS IAW ETL 94-2

Digital electrical meters shall be provided for all new facilities and all major remodels. The meter multiplier shall be clearly marked on the inside of the meter. Calculations determining the meter multiplier shall be submitted to the Contracting Officer for approval. Meters shall be generally located in rear of building or near service entrance. Each meter shall be wired to the EMCS system.

9.23 O&M MANUALS

Provide one set of hard covered O&M manuals and four sets of O&M manuals on CD ROM.

9.24 AS BUILT DRAWINGS

All field changes shall be annotated on the As Built drawings prior to facility acceptance.

9.25 INTRA-BUILDING WIRING POLICY

See Section 10, Telecommunication Standards.